CLAIMS

1. Method for measuring degradations of a digitized image introduced when coding the image, said method consisting of dividing the image into coding blocks using a coding grid and applying a coding processing on pixel data in each block, making use of a block transform calculation and an inverse block transform calculation, characterized in that it includes the following steps:

- determining (11) the coding grid of the coded image, in order to find the image division into coding blocks, used when coding the image,
- shifting (12) the coding grid with respect to the coded image, so as to define an image division into analysis blocks ($B_{i,j}$) each covering a boundary (23) between two adjacent coding blocks (21, 22),
- applying (13) the block transform calculation to pixel data ($f_{i,j}(x,y)$) in the coded image using the shifted coding grid to obtain transformed coefficients ($DC_{i,j}$, $AC_{i,j}(u,v)$) for each analysis block ($B_{i,j}$) defined by the shifted coding grid,
- extracting (14) coefficients that could be affected by a block effect resulting from coding of the image, from the transformed coefficients,
- applying (15) the inverse block transform calculation to the extracted transformed coefficients to determine the pixel data ($I_{i,j}(x,y)$) for each analysis block,
- for each analysis block, estimating (17) an indicator ($\upsilon_{i,j}$) of the degradation due to block effects, using pixel data ($f_{i,j}(x,y)$) in the coded image and pixel data

($I_{i,j}(x,y)$) in each analysis block, obtained by the inverse transform calculation, and

- determining (17) an image degradation measurement (υ) by summing the degradation indicators ($\upsilon_{i,j}$) of each analysis block.

2. Method according to claim 1, characterized in that the estimation a degradation indicator ($\upsilon_{i,j}$) for each analysis block ($B_{i,j}$) comprises steps of:

- calculating an average of inter pixel differences ($\Delta I_{i,j}$) at the inter block boundary (23) of the coding grid, covered by the analysis block, using pixel data ($I_{i,j}(x,y)$) obtained for the analysis block,
- calculating an average ($\mu_{i,j}$) and a standard deviation ($\sigma_{i,j}$) applicable to pixels in the two adjacent blocks (21, 22) on the coding grid, partially covered by the analysis block,
- calculating a weighting factor ($w_{i,j}$) as a function of the average and the standard deviation obtained for the analysis block, and
- calculating a spatial activity ($ACT_{i,j}$) of the analysis block using spatial activities ($ACT_{i,j}^{G}$ $ACT_{i,j}^{D}$) determined for each of the two adjacent blocks (21, 22) in the coding grid partially covered by the analysis block,
- the analysis block degradation indicator being determined as a function of the calculated average of inter pixel differences, the weighting factor and the spatial activity of the block.

3. Method according to claim 2, characterized in that the analysis block degradation indicator is obtained using the following formula:

$$\upsilon_{i,j} = \frac{\Delta I_{i,j} w_{i,j}}{1+\psi\left|ACT_{i,j}\right|}$$

in which $\Delta I_{i,j}$ is the average of inter pixel differences at the inter block boundary (23) of the coding grid covered by the analysis block, $w_{i,j}$ is the weighting factor, ψ is a predefined constant, and $ACT_{i,j}$ is the spatial activity of the analysis block.

4. Method according to either claim 2 or 3, characterized in that the transform calculation is applied to coding blocks of the coded image, the spatial activities ($ACT^{G}_{i,j}$ $ACT^{D}_{i,j}$) determined for each of the two coding blocks (21, 22) being obtained from the transformed coefficients ($DC_{i,j}$, $AC_{i,j}(u,v)$) for each of the two coding blocks.

5. Method according to claim 4, characterized in that the spatial activities ($ACT^{G}_{i,j}$ $ACT^{D}_{i,j}$) determined for each of the two coding blocks (21, 22) are obtained from the following formulas:

$$ACT^{G}_{i,j} = \frac{1}{1+DC^{G}_{i,j}}\sqrt{\sum_{\substack{u,v=0\\u+v\neq 0}}^{7}\left[AC^{G}_{i,j}(u,v)Nill(u,v)\right]^{2}}$$

$$ACT^{D}_{i,j} = \frac{1}{1+DC^{D}_{i,j}}\sqrt{\sum_{\substack{u,v=0\\u+v\neq 0}}^{7}\left[AC^{D}_{i,j}(u,v)Nill(u,v)\right]^{2}}$$

in which $DC^G_{i,j}$ and $AC^G_{i,j}(u,v)$ and $DC^D_{i,j}$ and $AC^D_{i,j}(u,v)$ are the transformed coefficients for each of the two adjacent coding blocks (21, 22) partially covered by the analysis block, and Nill(u,v) is a masking function modelling masking by neighbourhood.

6. Method according to one of claims 2 to 5, characterized in that the average ($\mu_{i,j}$) and standard deviation ($\sigma_{i,j}$) calculated for each analysis block ($B_{i,j}$) are determined from transformed coefficients ($DC_{i,j}$, $AC_{i,j}(u,v)$) for each of the two adjacent coding blocks (21, 22) partially covered by the analysis block.

7. Method according to one of claims 2 to 6, characterized in that the weighting factor ($w_{i,j}$) is obtained by the following formula:

$$w_{i,j}(\mu_{i,j},\sigma_{i,j},\zeta) = \begin{cases} \lambda \ln\left(1+\dfrac{\sqrt{\mu_{i,j}}}{1+\sigma_{i,j}}\right) \text{if } \mu_{i,j} \le \zeta \\ \ln\left(1+\dfrac{\sqrt{255-\zeta}}{1+\sigma_{i,j}}\right) \text{else,} \end{cases}$$

$$\text{in which } \lambda = \frac{\ln\left(1+\dfrac{\sqrt{255-\zeta}}{1+\sigma_{i,j}}\right)}{\ln\left(1+\dfrac{\sqrt{\zeta}}{1+\sigma_{i,j}}\right)}$$

$\mu_{i,j}$ and $\sigma_{i,j}$ are the average and standard deviation respectively calculated for each analysis block ($B_{i,j}$) and ζ is a parameter corresponding to the maximum sensitivity of the human eye.

8. Method according to one of claims 1 to 7, characterized in that analysis blocks that could contain a block effect are selected before estimating a degradation indicator ($\upsilon_{i,j}$) for each analysis block ($B_{i,j}$).

9. Method according to claim 8, characterized in that the prior selection comprises a step consisting of separating analysis blocks ($B_{i,j}$) for which the extracted transformed coefficients are greater than a predetermined threshold.

10. Method according to either claim 8 or 9, characterized in that the prior selection comprises a step consisting of selecting analysis blocks ($B_{i,j}$) with pixels ($I_{i,j}(x,y)$) with an energy representing a significant proportion of the energy of the block, at the inter block boundary (23) of the coding grid covered by the analysis block.

11. Method according to one of claims 1 to 10, characterized in that the coding grid is shifted horizontally with respect to the coded image.

12. Method according to one of claims 1 to 11, characterized in that the coding grid is shifted vertically with respect to the coded image.

13. Method according to one of claims 1 to 12, characterized in that the block transform calculation is a discrete cosine transform calculation.

14. System for measuring degradations of a digitized image introduced when coding the image, characterized in that it comprises calculation means for implementing the method according to one of claims 1 to 13.